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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/710,566

Filing Date: July 21, 2004

Appellant(s): KIM ET AL.

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Marshall M. Curtis  
Reg. No. 33,138  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 11/19/2007 appealing from the Office action mailed 04/03/2007.

### **I. Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

### **II. Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

### **III. Status of Claims**

The statement of the status of claims contained in the brief is correct.

### **IV. Status of Amendments After Final**

No amendment after final has been filed.

### **V. Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is incorrect.

The statement "three embodiments of the invention are summarized in ¶0026" (pg 8, last line of first paragraph) is incorrect. In the instant specification, only the first embodiment (see ¶18) is discussed at ¶26 (also ¶57). The additional embodiments are discussed elsewhere, as follows: two variants of the second embodiment (¶19 & ¶20) are discussed at ¶33 and ¶39 (also ¶58); the third embodiment (¶21 & ¶23) is discussed at ¶48 (also ¶59).

It seems Fig 1 is a generic starting point and individual embodiments are characterized in the following additional figures: first embodiment in Fig 3-9 (¶18); second embodiment in Fig 10-14B (¶19) and 15A-15G (¶20); third embodiment in Fig 16, 17 and 19-22 (¶s 21, 23, 48 & 49).

The statement “third embodiment of the invention, illustrated in Figures 15-22” (pg 10, first line of second paragraph) contradicts the originally filed specification. As summarized above, it seems Fig 15 illustrates the second embodiment and that Fig 16, 17, and 19-22 illustrate the third embodiment, while Fig 18 is for comparison (¶22).

The statement “independent claim 14” (pg 10, bottom of second paragraph) is confusing in that the wording of claim 14 implies dependency from claim 12. As a formal note, the fee worksheet of 07/21/2004 indicates only three independent claims. Claims 1, 12 and 16 are clearly independent.

## **VI. Grounds of Rejection to be Reviewed on Appeal**

Appellant’s stated grounds of rejection to be reviewed on appeal is correct.

## **VII. Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

## **VIII. Evidence Relied Upon**

US 6,620,677	Hummler	Filed: May 31, 2002
US 6,837,965	Gustafson et al.	Filed: Aug. 14, 2002

## **IX. Grounds of Rejection**

The following grounds of rejection are applicable to the appealed claims:

Claims 1-4, 7-12, and 14-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Hummler (US 6,620,677).

**RE claim 1**, Hummler discloses (Fig 1-11) a method for manufacture of an integrated circuit (col 1 In 15-17) having structures formed in respective first (16) and second (18) areas thereon, said method comprising steps of:

reducing height of structures in said first (46 in Fig 7A – 48 in Fig 8; also 14 in Fig 5A gone in Fig 6A) and second (39 in Fig 1A – 40 in Fig 2A; also, at same time as said first in Fig 7A: 44 gone in Fig 8) areas to control step height in said first and second areas (recited purpose does not further limit claim since it does not require additional non-recited steps; MPEP § 2111.04; reducing height necessarily controls step height);

removing a material (46 in Fig 7A gone in Fig 8) from said first and second areas (col 6 In 52-54, col 5 In 50) sequentially, and replacing said material (Fig 9) removed from said first and second areas with a first material (50) in said first area and a second material (50) in said second area, respectively, one of said first and second materials being an isolation material (col 6 In 66),

using a polysilicon block-out mask (44; col 6 In 17-21) to protect said second area to separately process (col 6 In 29-35) the first area,

planarizing (col 7 In 5-9) said first and second materials to provide a planar surface (top surface in Fig 10A), and

completing said integrated circuit (col 7 In 54-55).

**RE claim 2**, Hummler discloses said isolation is an array top oxide (col 7 In 1).

**RE claim 3**, Hummler discloses a polysilicon hard mask is used to mask said second area (col 6 In 17-21, 26-28).

**RE claim 4**, Hummler discloses said polysilicon hard mask comprises a single layer (44) of polysilicon.

**RE claim 7**, Hummler discloses depositing a nitride liner (42; col 6 In 10-12) prior (Fig 8-9) to said step of depositing said isolation material (50).

**RE claim 8**, Hummler discloses equalizing (average) heights of structures (48, 34, 38) in said first and second areas by etching prior to said planarizing step.

The above rejection of claim 8 relies on interpreting the term "equalizing" consistent with applicant's disclosure, e.g. Fig 16 and spec ¶50 In 5-6.

**RE claim 9**, Hummler discloses said integrated circuit is a memory device, said first area is a memory array area and said second area is a support area (col 5 In 9-11).

**RE claim 10**, Hummler discloses said integrated circuit includes an embedded memory, said first area is a memory array area and said second area is a support area (col 5 In 9-11).

**RE claim 11**, Hummler discloses wherein said planarizing step includes: applying a planarizing material (ARC) over said structures in said first and second areas and said first and second materials, and non-selectively etching (RIE) said planarizing material, said first material, said second material and said structures (col 7 In 5-10).

Non-selectivity is apparent in going from Fig 9 to Fig 10A in that the entire top surface is uniformly etched, no selected region was etched differently.

**RE claim 12**, Hummler discloses a method for planarizing a surface having structures formed thereon and an additional layer (50) of material covering said surface and said structures formed on said surface, said method including steps of applying a planarizing material (ARC) to said additional layer of material (col 7 In 3-7) to form a substantially planar surface above said surface having structures formed thereon, and

performing a non-selective etching (RIE) from said substantially planar surface to a said predetermined structure formed thereon col 7 In 5-10).

**RE claim 14**, Hummler discloses said structures have a first average height in a first area of said surface and structures of a second average height greater than said first average height in a second area of said surface (Fig 8), said method comprising the further steps of:

etching said structures of said second average height to an average height substantially equal to said first average height (substantially equal interpreted to include slightly greater),

subsequent to said etching step, applying a planarizing material (ARC) to said first and second areas of said surface and covering said structures remaining in said first and second areas whereby a surface of said planarizing material is substantially planar (col 7 In 5), and

performing said step of non-selectively etching (RIE) said planarizing material and structures overlaid by said planarizing material to completely remove said planarizing material and form a planar surface (no ARC in Fig 10).

**RE claim 15**, Hummler discloses said step of non-selective etching includes removal of a nitride liner (Fig 9: 42) below said layer of material (col 7 ln 7).

**RE claim 16**, Hummler discloses a method for planarizing a surface of a body of material, said method including steps of: applying a planarizing material (ARC) to said body of material to form a substantially planar surface, and performing a non-selective etching (RIE) from said substantially planar surface to a point on or within said body of material (col 7 ln 5-7).

**RE claim 17**, Hummler disclose the method in combination with a top oxide early process for forming an integrated circuit (col 3 ln 41-43, col 8 ln 12-20).

**RE claim 18**, Hummler the method in combination with a top oxide nitride process for forming an integrated circuit (col 3 ln 41-43, col 8 ln 12-20).

**RE claim 19**, Hummler the method in combination with a top oxide late process for forming an integrated circuit (col 3 ln 41-43, col 8 ln 12-20).

**RE claim 20**, Hummler discloses adjusting height of a structure on a differentiated area of said body of material (e.g. etches of Fig 2A, 6A, or 8).

Claims 5 and 6 are rejected under 35 USC 103(a) as being unpatentable over Hummler.

**RE claims 5 & 6**, Hummler discloses said first area is not processed during processing of said second area (18; remove nitride: col 7 ln 31-34).

Hummler differs from the claimed invention only in not expressly disclosing a polysilicon hard mask is used to mask said first area during processing of the second.

Hummler discloses a single layer polysilicon hard mask (col 6 ln 18-21) is used to mask the second area (col 6 ln 30-33) during processing (remove nitride: col 6 ln 34) of the first area (col 6 ln 35).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made that a polysilicon hard mask is used to mask said first area, and that said polysilicon hard mask comprises a single layer of polysilicon; at least to prevent processing the first area by using a known suitable material.

Claim 13 is rejected under 35 USC 103(a) as being unpatentable over Hummler as applied to claim 12 above, and further in view of Gustafson (US 61837,965).

**RE claim 13**, Hummler discloses (Fig 11) determining termination of said step of non-selective etching (col 7 ln 40-42: stopping inherently done by determining stopping).

Hummler differs from the claimed invention only in not expressly disclosing end point detection.

Gustafson discloses end point detection (col 1 ln 29) during the etch of a bulk material of a substrate (col 1 ln 24).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made that Hummler, in view of Gustafson, include performing end point detection to detect a material interface for determining termination of said step of non-selective etching; at least to etch only as much as desired.

## **X. Response to Argument**

### ARGUMENT VIIC. Rejections under 35 U.S.C. § 102

#### Introduction

Appellant argues that “Examiner has admitted...that certain claim recitations have been given no weight and essentially ignored” (pg 22, ¶1, ln 3). Examiner disagrees because all claim recitations have been fully considered and accorded all weight to which they are entitled. Hummler contains teachings which answer all claimed recitations; there is no admission to the contrary.

Appellant argues hindsight (pg 22, ¶1, ln 14), however, the present rejections rely only on the references and knowledge available to one of ordinary skill at the time of the claimed invention, there is no reliance on the present application for rejection.

Appellant argues “the Examiner has effectively refused to consider the very features of the invention...” (pg 22, ¶1, ln 15), however, any features of the invention which might differ from Hummler are not found in the current claim language.

#### Claims 1 – 4 and 7 – 12

Appellant argues that Hummler does not explicitly say “step height” (pg 23, ln 1 & 10). Examiner maintains that the recitation “to control step height” does not patentably distinguish from Hummler per MPEP § 2111.04 since it merely expresses the intended result of the positively recited step of reducing height of structures in said first and second areas, which is disclosed in Hummler. Nothing in the present application defines or otherwise limits “control step height” to anything other than reducing the

height of any arbitrary structure which may be subsequently overlaid. Further, Hummler reduces the height of structures, which necessarily and inherently controls step height.

Appellant discusses certain features of Hummler (pg 23 ln 1-15), which is misleading since other features of Hummler are relied upon (see rejection above) as disclosing the claimed “reducing height of structures” for rejection.

Appellant highlights a typographical error “does (sic) limit” (pg 23, ln 17). Examiner submits that the position of the office action is clear, the recited purpose has been fully considered and accorded all weight to which it is entitled. The reduction disclosed in Hummler is encompassed by the currently presented claim language.

Appellant argues “the first and second areas are not identified...” (pg 24 ln 6); it is respectfully pointed out that Hummler explicitly identifies the first area (16) as the memory array region and the second area (18) as the support region (col 5 ln 1-10).

Appellant argues “using a polysilicon hard mask alone” (pg 24 ln 7-10), however, nothing in the claim requires “using a polysilicon hard mask alone (e.g., without a nitride liner)”, the language merely requires a polysilicon hard mask “is used” (claim 3), which “comprises” a single layer (claim 4) but can include “two layers of different materials”, as recited in claim 1 (¶4).

Appellant’s arguments regarding claims 5 and 6 (pg 24 ln 3, 7 & 10) will be answered with the other 103 rejections below.

Appellant argues, with regard to claim 8, that “the average heights...are also very different” (pg 24 ln 16). However, the claim language “equalizing” is interpreted in view of the supporting portions of the specification, which recite “average height in the

support height approximates the average height...in the array area" (¶50 ln 1-6). The claim language "structures" is so broad as to read on any physical object. For example, referring to figure 9 of Hummler: structure 34 in first area 16 is approximately the same height as structure 14 in second area 18; average height of structure 48+34 in first area 16 is approximately the same height as structure 38 in second area 18.

Appellant argues, regarding claim 11, that "no mention is made of the etch being non-selective or that a substantially planar surface is sought" (pg 24 ln 24-26, emphasis added), however both features are clearly shown in Fig 9-10. Especially telling is that both materials 50 and 42 are etched equally in going from Fig 9 to Fig 10, there having clearly been no selectivity toward either material (col 7 ln 18-20). Fig 10 very clearly depicts a planar upper surface as the result of the etch (col 7 ln 5-9).

Appellant's argument, regarding claim 11, that "there is no enabling disclosure.." (pg 24 ln 26) is unsubstantiated; Hummler is presumed valid and enabling absent evidence to the contrary. See MPEP §§ 2121(I), 716.07, 2145(I) and 716.01(c)(II) . The RIE referred to in Hummler (col 7 ln 5-9) is well-known in the art.

Appellant's cited "particulars...of obtaining...non-selective etch" (pg 25 ln 1-3), relevant to claim 11, are neither claimed nor the only conditions yielding non-selectivity.

#### Claims 12 and 16-20

Appellant's arguments against claims 12 and 16 have been answered regarding claim 11 above. Hummler shows that the etch is non-selective (from Fig 9 to Fig 10) and that said etch (col 7 ln 5-9) achieves planarity (top in Fig 10).

Appellant argues “Hummler is limited to an exemplary top oxide early process” (pg 25 ¶3). Examiner submits that Hummler is in no way so limited. Note that TOE, TON and TOL processes are very similar and differ only in the order certain steps, as evidenced, for example, in ¶5 of the instant specification; Hummler discloses all three processes (col 3 ln 41-43), discusses a TOE process as an example “comprised” (open language) by the invention (col 4 ln 25-26) and says the order of steps may be rearranged (col 8 ln 19-20), thus encompassing all three processes.

Appellant’s arguments regarding claim 20 (pg 25 last three lines – pg 26 ln 6) were answered with regard to claim 8 above.

#### Claims 14 – 15

Appellant argues “a substantial height difference” (pg 26, ¶2, ln 9-10); however, as discussed for claim 8 above, the claim language encompasses Hummler, especially when interpreted in view of the support found in the disclosure (¶50 ln 1-6).

#### ARGUMENT VIID. Rejections under 35 U.S.C. § 103

##### A. Claims 5 and 6

Appellant argues the rejections of claims 5 and 6 are improper since the rejection of claim 1 is improper (pg 28 ln 3-5). The rejection of claim 1 is shown proper above.

Appellant argues there is “no compelling line of reasoning” (pg 23 ln 9-10). However, the rejection asserts by logical reasoning that masking the first area (while processing the second) would obvious in view of disclosure of masking the second

(while processing the first) in Hummler (col 6 ln 18-35, see rejection of claim 5 and 6 above); the simple reversal would be obvious to one skilled in the art.

**B. Claim 13**

Using a known method (end point detection of Gustafson) to achieve a desired effect (one of ordinary skill would not want to over etch) is obvious. Both Gustafson and Hummler are concerned with precisely controlled etching processes.

**XI. Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

**Conclusion**

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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31 January 2008

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